REMARKS

Claims 1-70 are pending in the application. Claims 1-70 are rejected. The Drawings are objected to. The Specification is objected to. All rejections and objections are respectfully traversed.

Figure 7 is objected to as containing an extraneous item number (404). A substitute Figure 7 with the item deleted and a marked-up copy are submitted herewith.

Paragraph [0202] is amended herein to insert reference to item 750 in Figure 7.
Paragraph [0280] is amended herein to insert reference to item 800 in Figure 8.
Paragraph [0113] is amended herein to insert reference to Figure 13.
The Examiner is directed to paragraph [0115], where item 1350 is referenced in the Specification.
Paragraph [0267] is amended herein to reference Figure 4 as suggested by the Examiner.
Paragraph [0340] is amended herein to overcome the Examiner's objection.

Claims 35, 45, 47, 48, 53 and 56-60 are rejected under 35 U.S.C. 102(b) as being anticipated by Frisken et al. ("Adaptively Sampled Distance Fields: A General Representation of Shape for Computer Graphics").

Composite glyphs are glyphs that are made up of elements. As a simple example, the letter 'T' includes a horizontal element [–] atop and centered over a vertical element [|]. The composition of the two elements produces the 'T' glyph. This is known in the art as a composite glyph. Traditional composite glyph rendering

methods take one of two approaches. A first type of method renders the overlapping elements in a particular order, and either overwrite or blend pixels in an overlapping region of the composite glyph. A second method converts the elements making up the composite glyph into a single object and renders the single object. Where distance fields have been used to represent elements of a composite glyph, the distance fields have always been combined into a single distance field representing the object prior to rendering. The invention is different from the prior art.

Claim 35 recites a method for rendering a region of a composite glyph. A composite glyph is defined by a set of elements. A set of two-dimensional distance fields is generated using the set of elements, where each two-dimensional distance field in the set of two-dimensional distance fields is partitioned into cells, each cell including a method for reconstructing the corresponding two-dimensional distance field within the cell, a composition of the set of two-dimensional distance fields representing the composite glyph. A region of the composite glyph is rendered using the set of two-dimensional distance fields. There is nothing in the prior art that describes generating a set of two-dimensional distance fields using the elements of a composite glyph and rendering a region of the composite glyph using the set of two-dimensional distance fields.

According to the invention, a composite glyph is defined by a set of elements. The Examiner points to Figure 4d in Frisken as disclosing the set of elements defining the composite glyph. However, Figure 4d is an illustration of a single adaptively sampled distance field representing an object. The object has no set of elements. There is only one object and one ADF representing the object. Frisken does not describe composite glyphs anywhere. There is no composition of a set of elements

shown. The different sized squares in Figure 4d are representative illustrations of cells of the single adaptively sampled distance field representing the object. There is no set of elements defining a glyph as claimed. Therefore, Frisken can never anticipate what is claimed.

A set of two-dimensional distance fields is generated using the set of elements, where each two-dimensional distance field in the set of two-dimensional distance fields is partitioned into cells, each cell including a method for reconstructing the corresponding two-dimensional distance field within the cell, a composition of the set of two-dimensional distance fields representing the composite glyph. As stated above, Frisken describes a single ADF representing a single object. Frisken can never anticipate what is claimed.

Further the Examiner mischaracterizes section 3.3 of Frisken by stating "lines 5-9 disclose the use of distance fields for rendering." In fact, the lines describe including a method for estimating surface normals when processing an ADF, because rendering requires surface normals. Claimed is rendering a region of the composite glyph using the set of two-dimensional distance fields. MPEP 2131 explicitly states that in order to anticipate a claim "each and every element as set forth in the claims" must be found in the prior art reference." The identical invention must be shown in as complete detail as is contained in the ... claim." Frisken fails to teach composite glyphs defined by a set of elements, generating a set two-dimensional distance fields using the elements, or rendering a region of the composite glyph using the set of two-dimensional distance fields. Frisken can never anticipate what is claimed.

In claim 45, a particular element in the set of elements is a distance field. In claim 47, a particular element in the set of elements is an adaptively sampled distance field. In claim 48, a particular element in the set of elements is a procedure. As stated above, Frisken never describes elements in a set of elements defining a compound glyph as claimed. Frisken can never anticipate what is claimed.

In claim 53, the defining is performed automatically by a procedure. In claim 56, the defining further comprises determining a shape descriptor for a particular element in the set of elements and determining a distance function for the shape descriptor to define the particular element. In claim 57, the defining determines the set of elements from a distance field of a shape descriptor for the composite glyph. Frisken describes representing a single object with a single distance field. Claimed is defining a composite glyph by a set of elements. Frisken does not anticipate what is claimed.

In claim 58, a particular two-dimensional distance field in the set of two-dimensional distance fields is an adaptively sampled distance field. In claim 59, a particular two-dimensional distance field in the set of two-dimensional distance fields comprises a set of distances stored in a memory. In claim 60, a particular two-dimensional distance field in the set of two-dimensional distance fields is represented by a procedure. Frisken describes representing a single object with a single distance field. Claimed is defining a composite glyph by a set of elements and generating a set of two-dimensional distance fields using the set of elements. Frisken does not anticipate what is claimed.

Claims 1, 9-14 and 16-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al. in view of Russ ("The Image Processing

Handbook, Fourth Edition") in view of Kimmel et al. (U.S. Patent Publication No. 2002/0097912) and in further view of Perry et al. ("Kizamu: A System for Sculpting Digital Characters").

Claim 1 recites a method for rendering a region of a composite glyph. A composite glyph is defined by a set of elements. A set of two-dimensional distance fields is generated using the set of elements, wherein each two-dimensional distance field in the set of two-dimensional distance fields is partitioned into cells, each cell including a method for reconstructing the corresponding two-dimensional distance field within the cell, a composition of the set of two-dimensional distance fields representing the composite glyph. A region of the composite glyph is rendered using the set of two-dimensional distance fields.

The rendering step includes identifying, for each two-dimensional distance field in the set of two-dimensional distance fields, a set of cells of the two-dimensional distance field, the set of cells associated with the region of the composite glyph. A set of pixels associated with the region and a set of components for each pixel in the set of pixels are located an antialiased intensity for each component of each pixel in the set of pixels is determined. For each two-dimensional distance field in the set of two-dimensional distance fields, a corresponding distance for the component of the pixel is determined from the corresponding set of cells. Corresponding distances are combined to determine a combined distance and the combined distance is mapped to the antialiased intensity of the component of the pixel.

Frisken describes generating adaptively sampled distance fields (ADFs). An adaptively sampled distance field includes adaptively sampled distance values

organized in a spatial data structure together with a method for reconstructing the underlying distance field from the sampled values, see page 250, left column, 2nd full paragraph.

As stated above with respect to claim 35, the Examiner points to Figure 4d in Frisken as disclosing the set of elements defining the composite glyph. However, Figure 4d is an illustration of a single adaptively sampled distance field representing an object. The object has no set of elements. There is only one object and one ADF representing the object. Frisken does not describe composite glyphs anywhere. There is no composition of a set of elements shown. The different sized squares in Figure 4d are representative illustrations of cells of the single adaptively sampled distance field representing the object. There is no set of elements defining a glyph as claimed.

A set of two-dimensional distance fields is generated using the set of elements, where each two-dimensional distance field in the set of two-dimensional distance fields is partitioned into cells, each cell including a method for reconstructing the corresponding two-dimensional distance field within the cell, a composition of the set of two-dimensional distance fields representing the composite glyph. Frisken describes a single ADF representing a single object.

Further the Examiner mischaracterizes section 3.3 of Frisken by stating "lines 5-9 disclose the use of distance fields for rendering." In fact, the lines describe including a method for estimating surface normals when processing an ADF, because rendering requires surface normals. Claimed is rendering a region of the composite glyph using the set of two-dimensional distance fields. Frisken fails to teach composite glyphs defined by a set of elements, generating a set two-

dimensional distance fields using the elements, or rendering a region of the composite glyph using the set of two-dimensional distance fields.

The rendering step includes identifying, for each two-dimensional distance field in the set of two-dimensional distance fields, a set of cells of the two-dimensional distance field, the set of cells associated with the region of the composite glyph. Frisken operates in a single ADF representing a single object. Claimed is a set of two-dimensional distance fields representing a set of elements defining a composite glyph. Cells associated with the region of the composite glyph are identified from among the set of two-dimensional distance fields. Frisken never describes any such identifying step.

A set of pixels associated with the region and a set of components for each pixel in the set of pixels are located an antialiased intensity for each component of each pixel in the set of pixels is determined. It should be understood that the Examiner refers to section 3.3 of Frisken, which describes reconstructing a ***three***-dimensional adaptively sampled distance field (ADF). The Examiner's rejection based on Frisken does not make sense for at least two reasons. First, the cited section describes operations for three-dimensional distance fields, but the invention operates on two-dimensional distance fields. Second, reconstructing distance values between sampled points in a 3D ADF can never make obvious locating a set of pixels associated with the region of a composite glyph, defined by elements represented by two-dimensional distance fields as claimed. It appears the Examiner has confused three-dimensional (x,y,z) coordinates with in a three-dimensional distance field as taught by Frisken at page 252, with two-dimesional pixel locations.

Further, the Examiner asserts that section 3.2 of Frisken "discloses the use of Euclidian distance functions for determining the distance value at the pixel level." No such thing is true. In reality, section 3.2 of Frisken has nothing to do with pixels at all. There, generating an ADF from some underlying representation, such as a triangle model or a parametric model, is described. Section 3.2 describes "procedures that determine Euclidean distance to a parametric surface," and "other distance functions include Euclidean distances for a triangle model that can be computed as the minimum of the signed distances to each of the triangles in the model," and " distance fields computed by applying Boolean operations to the distance fields of primitive elements in a CSG representation," see Frisken, section 3.2, 2nd paragraph. The above are distance functions used to generate an ADF, see section 3.2, 1st paragraph. There is no mention of pixels because the distance functions determine Euclidean distance within a model, e.g., triangle model, or a regularly sampled distance field, to generate an ADF. The Examiner's assertion is incorrect.

Russ operates entirely on images. Russ describes a Euclidean Distance Maps (EDM) as "a tool that works on a binary image to produce a grey-scale image." Page 427, lines 6-7. An EDM approximates, for each pixel in a discrete image, a distance from the pixel to the nearest background pixel of a binary image. Russ takes a binary image as input. The output is a grey-scale image that is a rendering of the EDM. Russ assigns a brightness to a pixel based on the pixel's distance to a nearest background pixel, see page 427, lines 6-11. Russ determines distances between pixels in an image. Claimed is determining an antialiased intensity for each component of each pixel in the set of pixels by determining, for each two-dimensional distance field in the set of two-dimensional distance fields, a

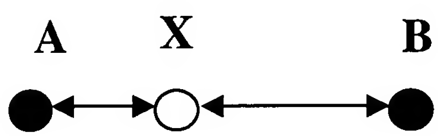
corresponding distance for the component of the pixel from the corresponding set of cells . Russ can never be used to make the invention obvious.

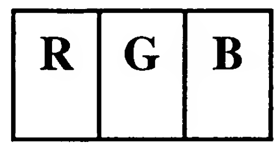
Russ never maps distance derived from a set of cells of each two-dimensional distance field representing elements defining a composite glyph as claimed. Russ derives distances directly from pixels in images. It appears that the Examiner has confused generating EDM according to Russ, with a determining a distance from a set of cells of each two-dimensional distance field representing elements defining a composite glyph, combining the corresponding distances to determine a combined distance and mapping the combined distance to the antialiased intensity of the component of the pixel, as claimed.

Russ, at lines 26-30, does not describe a mapping from distance derived from a two-dimensional distance field to intensity. There, Russ describes determining and representing the distances of an EDM from a binary image to produce a grey-scale image.

Kimmel describes EDMs having "sub-pixel" accuracy. The Examiner confuses sub-pixel accuracy with a pixel component as claimed. The sub-pixel accuracy in Kimmel is obtained by interpolation. Interpolation is typically done, as in Kimmel, when the pixels in one image have a different resolution, i.e., the spacing between the pixels, than the pixels in another image. Kimmel describes a linear interpolation. For example, in the left figure below, the intensity of pixel X is determine from pixel A and pixel B. According to Kimmel the intensity of pixel X can be determined from the linear distance between A-X, and X-B. It should be noted the distances are measured at the center of the pixels in Kimmel. Measuring at the center of a pixel specifically precludes considering pixel components, as

claimed. The figure on the right shows a pixel with three (RGB) color components according to the invention. Those of ordinary skill in the art would not confuse interpolation between pixels as in Kimmel with pixel components as claimed. Sub-pixel accuracy and multiple resolutions have to do with the **inter-pixel** spacing and geometry. Pixel components have to do with the **intra-pixel** physical structure of a pixel.





"Sub-pixel accuracy" does not mean that Kimmel computes distances for each sub-component of a pixel. Kimmel states ***explicitly*** that distances are computed at pixel centers. Kimmel intensities are determined from discrete pixel images, which can never make the invention obvious. The invention operates on continuous distance values of a distance field. The Examiner has confused sub-pixel accuracy, which means that the EDM distances are propagated from distances at boundary pixels that were computed from the boundary of the object to sub-pixel accuracy, with pixel components. A pixel component is a physical element, e.g., a portion of red, green, or blue phosphor, or a red, green, or blue LCD that produces red, green or blue light. Pixel components have physical locations in a display device. Pixel components have nothing to do with the geometry of inter-pixel spacing that is determined by interpolation as in Kimmel.

Kimmel describes constructing an EDM that has sub-pixel accuracy and sub-pixel precision. Unlike the methods for computing EDMs described in Russ, which compute distances from pixels to a binary object representation where accuracy is

limited to the pixel resolution of the binary object representation, Kimmel computes distances from boundary pixels to a boundary of an object to sub-pixel accuracy. According to Kimmel, boundary pixels are pixels within a limited distance from the boundary of the object, i.e., less than the diagonal length of a pixel from the boundary of the object. Distances outside of that boundary region are computed by propagating the sub-pixel accurate distances using a method similar to level set methods and to Euclidean Distance Transform methods. Therefore, Kimmel cannot be combined with Russ.

Further, the propagated distances of Kimmel are different from true Euclidean distances to the boundary of the object and hence Kimmel's EDM is different from a distance field which means that Kimmel cannot be combined with Frisken either. Therefore, Kimmel never determines a distance for the component of the pixel from the two-dimensional distance field, or maps the distance to the antialiased intensity of the component of the pixel. Kimmel in silent on components of pixels.

Perry describes a system for sculpting digital character represented by ADFs. In section 7.1, Perry describes a method for generating a single three-dimensional distance field by combining triangle models generated from multiple range images of a single object. Distances from a sample point to each range surface generated by the range images are combined to generate a "closed, water-tight triangle surface from the signed distance volume." Perry always combines distance fields into a single distance field prior to rendering. Claimed is combining the corresponding distances from each two-dimensional distance field in the set to determine a combined distance for the component of the pixel. The distance fields are not combined as in Perry. Corresponding distances are combined and mapped to the antialiased intensity of the component of the pixel. Perry describes

generating a three-dimensional model of an object, and is useless for making the invention obvious. The Applicants request the Examiner reconsider and withdraw the rejection based on Frisken, Russ, Kimmel and Perry.

In claim 9, a particular element in the set of elements is a distance field. In claim 10, a particular element in the set of elements is a distance map. In claim 11, a particular element in the set of elements is an adaptively sampled distance field. In claim 12, a particular element in the set of elements is a procedure. In claim 13, a particular element in the set of elements is a distance function. In claim 14, a particular element in the set of elements is an implicit blend of a first shape descriptor and a second shape descriptor. In claim 16, a particular element in the set of elements is drawn by a user. None of the references relied on by the Examiner describes a composite glyph defined by a set of elements, generating a set of two-dimensional distance fields using the set of elements and rendering a region of the composite glyph using the set of two-dimensional distance fields, as claimed. Nothing in the prior art teaches representing a glyph as a composition of two-dimensional distance fields representing a set of elements as claimed.

In claim 17, the defining is performed automatically by a procedure. In claim 18, the defining is performed by a user. In claim 19, the defining is performed semi-automatically by a procedure and a user. In claim 21, the defining determines the set of elements from a distance field of a shape descriptor for the composite glyph. In claim 20, the defining further comprises determining a shape descriptor for a particular element in the set of elements and determining a distance function for the shape descriptor to define the particular element. However defined, the set of two-dimensional distance fields that represent the set of elements remain a set of two-dimensional distance fields. Corresponding distances are combined to map

distance to anti-aliased intensity. The relevant references represent objects as a single distance field to render the object. That can never make the invention obvious.

Claims 22-24 recite types of two-dimensional distance fields that can be in the set of two-dimensional distance fields. The Examiner is reminded that the set of two-dimensional distance fields is not combined into a single distance field as in the prior art. Any particular two-dimensional distance field in the set of two-dimensional distance fields can be an adaptively sampled distance field, a set of distances stored in a memory, or can be represented by a procedure.

Claims 25-34 recite details of the combining of the corresponding distances that produces the combined distance, which is mapped to the antialiased intensity of the component of the pixel. In the prior art, when a composite object such as a glyph has elements represented by two-dimensional distance fields, the distance fields are combined to generate a single distance field for rendering. The invention combines corresponding distances from a set of two-dimensional distance fields and maps the combined distance to an antialiased intensity of a component of a pixel. There is nothing in the references that describes combining corresponding distances as claimed.

Claims 2-8 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al. in view of Russ in view of Kimmel et al. in view of Perry et al. and in further view of the applicant's specification.

In claims 2-8, a particular element in the set of elements is a stroke, an outline, a radical, a stroked radical, a two-dimensional shape descriptor, a one-dimensional

shape descriptor, a path, or a skeletal descriptor with a corresponding offset descriptor, respectively. The Examiner is reminded that none of the references describes rendering a composite glyph using a set of two-dimensional distance fields, each representing an element in a set of elements defining the composite glyph. Russ and Kimmel are entirely inapplicable. Frisken teaches generating a single ADF representing an object. Perry always combines distance fields into a single distance field prior to rendering. The invention maps a combined distance, determined from the set of two-dimensional distance fields, to an antialiased intensity of a component of a pixel. The applicants own specification clearly distinguishes the blending, ordering, and distance field combining from what is claimed.

Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al. in view of Russ and in further view of Kimmel et al.

Claim 36 recites wherein the rendering further comprises identifying, for each two-dimensional distance field in the set of two-dimensional distance fields, a set of cells of the two-dimensional distance field, the set of cells associated with the region of the composite glyph, locating a set of pixels associated with the region, specifying a set of components for each pixel in the set of pixels and determining an antialiased intensity for each component of each pixel in the set of pixels. As stated above, Frisken teaches a single object represented by a single distance field. Claimed is a composite glyph having a set of elements defined by a set of two-dimensional distance fields. Further, the section referenced by the Examiner regarding locating pixels has nothing to do with locating pixels. There Frisken describes three-dimensional (x,y,z) coordinates in a three-dimensional distance field.

Further still, Russ determines distances between background and foreground pixels in an image to generate a gray scale image. Claimed is determining distances from cells of two-dimensional distance fields, combining the distances and mapping the combined distance to an antialiased intensity of a component of a pixel. Russ can never be used to make the invention obvious.

As stated above with respect to Kimmel, those of ordinary skill in the art would not confuse interpolation between pixels as in Kimmel with pixel components as claimed. Sub-pixel accuracy and multiple resolutions have to do with the **inter-pixel** spacing and geometry. Pixel components have to do with the **intra-pixel** physical structure of a pixel.

Claims 37 and 61-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al. in view of Russ in view of Kimmel et al. and in further view of Perry et al.

In claim 37, the determining further comprises determining, for each two-dimensional distance field in the set of two-dimensional distance fields, a corresponding distance for the component of the pixel from the corresponding set of cells, combining the corresponding distances to determine a combined distance; and mapping the combined distance to the antialiased intensity of the component of the pixel. Claims 61-70 recite details of the combining of the corresponding distances that produces the combined distance, which is mapped to the antialiased intensity of the component of the pixel.

The combining can perform a maximum of the corresponding distances, an arithmetic average, a union, an intersection, a difference, an implicit blend, an arithmetic operation, a conditional operation, a procedure, or can use a table to determine the combined distance. In the prior art, when a composite object such as a glyph has elements represented by two-dimensional distance fields, the distance fields are combined to generate a single distance field for rendering. The invention combines corresponding distances from a set of two-dimensional distance fields and maps the combined distance to an antialiased intensity of a component of a pixel. There is nothing in the references that describes combining corresponding distances as claimed.

Claims 38-44, 50 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al. in view of the applicant's specification.

In claims 38-44 and 50-51, a particular element in the set of elements is a stroke, an outline, a radical, a stroked radical, a two-dimensional shape descriptor, a one-dimensional shape descriptor, a path, an implicit blend of a first shape descriptor and a second shape descriptor, or a skeletal descriptor with a corresponding offset descriptor, respectively.

The Examiner is reminded that none of the references describes rendering a composite glyph using a set of two-dimensional distance fields, each representing an element in a set of elements defining the composite glyph. Russ and Kimmel are entirely inapplicable. Frisken teaches generating a single ADF representing an object. Perry always combines distance fields into a single distance field prior to rendering. The invention maps a combined distance, determined from the set of two-dimensional distance fields, to an antialiased intensity of a component of a

pixel. The applicants own specification clearly distinguishes the blending, ordering, and distance field combining from what is claimed.

Claims 46 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al. in view of Kimmel et al.

In claim 46, a particular element in the set of elements is a distance map. In claim 49, a particular element in the set of elements is a distance function. Here again, none of the references describes rendering a composite glyph using a set of two-dimensional distance fields, each representing an element in a set of elements defining the composite glyph. Frisken describes a single object represented by a single ADF. Kimmel describes sub-pixel accuracy and multiple resolutions related to **inter-pixel** spacing and geometry. Pixel components have to do with the **intra-pixel** physical structure of a pixel. Kimmel is irrelevant.

Claims 52, 54 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frisken et al. in view of Perry et al.

In claim 52, a particular element in the set of elements is drawn by a user. In claim 54, the defining is performed by a user. In claim 55, the defining is performed semi-automatically by a procedure and a user.

As stated above, Frisken teaches generating a single ADF representing an object. Perry always combines distance fields into a single distance field prior to rendering. The invention maps a combined distance, determined from the set of two-dimensional distance fields, to an antialiased intensity of a component of a

pixel. The combination of Perry and Frisken can never make the invention obvious.

All rejections have been complied with, and applicant respectfully submits that the application is now in condition for allowance. The applicant urges the Examiner to contact the applicant's attorney at the phone and address indicated below if assistance is required to move the present application to allowance. Please charge any shortages in fees in connection with this filing to Deposit Account 50-0749.

Respectfully Submitted,

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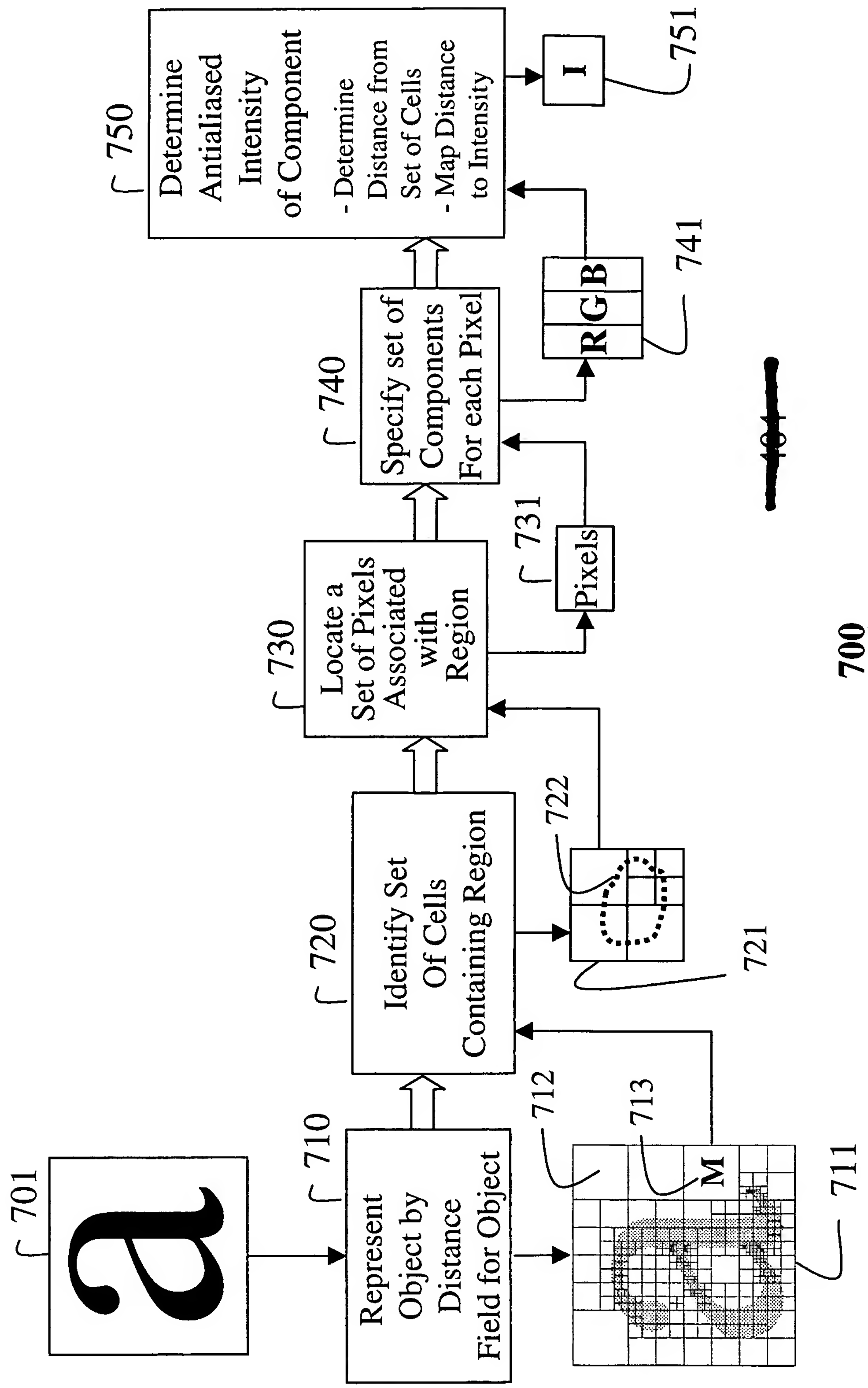

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Fig. 7